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THE IMPACT OF COVID-19 ON E-GROCERY MOBILE APPS: URBAN-TOWNSHIP PERSPECTIVE

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Abstract

COVID-19 has caused substantial impacts on businesses of all size across different economies. However, the e-grocery industry has experienced an unprecedented resurgence in demand caused by panic buying that strained the entire logistics elements from inventory, storage, unitization and packaging, transportation, to communication. Recent preliminary reports suggest that, compared to major e-grocery retailers, the strain is expected to shutter many small businesses. However, the substantial implications of the impacts on small businesses remain unknown. In South Africa, a group of urban, township, and rural small emerging e-grocery retailers make use of competitors' and third-parties' assets to stock, pick, store, and transport e-groceries, activities which are coordinated using mobile applications. This involves the use of competitors' grocery assets, such as stock and infrastructure (stores), to advance access into the e-grocery industry. This chapter qualitatively explores the impacts of COVID-19 on urban, township, and rural small e-grocery retailers whose logistics processes/ elements and operations rely on competitors' resources and third-party providers. The objective of the chapter is to discover how COVID-19 has re-aligned the logistics elements of eight small e-grocery retailers in the urban, township and rural areas of South Africa. Further, which parts of the logistics elements, if any, have been redefined, and how COVID-19 has impacted their operations, considering that most of their target markets in South Africa were reported to be negatively impacted by redundancy and unemployment. The findings provide evidence of how pandemics such as COVID-19 impact on small e-grocery commerce and add to current understanding of how pandemics create and disrupt e-grocery innovations.

Keywords: COVID-19, E-Grocery Mobile Applications, Logistics, Retail, Townships and Rural Areas

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1. Introduction

The year 2019 to 2020 has been engulfed by the global outbreak of coronavirus disease 2019 (COVID-19) that caused one of the greatest humanitarian crises of the 21st century, specifically, the negative effects on mortality and morbidity (Aruleba et al., 2020). Beyond the effects on lives and livelihoods, COVID-19 has caused chaotic disruptions across nations, supply chains, and businesses of all sizes. For instance, the disruption of offshore and outsource automotive companies like Fiat, Chrysler and Hyundai suppressed production and led to job losses in Serbia and Korea (Haren and Simchi-Levi, 2020; Kajjumba et al., 2020). The adverse effects of COVID-19 transcend the automotive industries to include the food supply chain, which although classified as an essential service, represents one of the highest contact points with a high potential source of infection in its final stage (Rizou et al., 2020).

Early studies on the implications of COVID-19 on the grocery and food supply chain (Hobbs, 2020; Mussell et al., 2020; Cranfield, 2020) reveal the demand shocks and bullwhip effects caused by panic buys, erratic consumption patterns, labor shortages, and interruptions to supply networks. The demand shocks have, ultimately, caused supply shocks across all e-grocery logistics elements from order entry, order stock, order pick, order delivery, to order storage. Preliminary reports (Wegerif, 2020; PMBEJD, 2020; Fairlie, 2020) suggest that compared to major e-grocery retailers, the strain is expected to shutter many small businesses. However, the substantial implications of the impacts on small businesses remain unknown. Hence, the interest in exploring the impact of COVID-19 on e-grocery mobile applications, whose distribution models' logistics elements and operations rely on competitors' resources and third-party providers.

Understanding the impact of COVID-19 on e-grocery mobile applications is crucial, on the one hand, for uncovering how small e-grocery retailers evolve in the face of a pandemic. While, on the other hand, it is important to harness the intelligence necessary for policy development and inspiring new theories on e-grocery mobile applications' supply chain resilience. To avoid speculation, the chapter is grounded on qualitative experience solicited from small e-grocery retailers' chief executive officers (CEO). The perspective of actual practices is more imperative considering that COVID-19 is still on the rise, and its scope, length, and timelines remain unknown at the time of writing this chapter. At worst, very little research is available, if any, on e-grocery mobile application in townships and rural areas shaped within a specific context. As such, the chapter provides fresh practical insights for the unexplored COVID-19 impact on e-grocery mobile applications. The supply and demand strategies that have been revealed in response to the constraints placed by the pandemic on order entry, order storage, order stock, order pick, and order delivery contribute to mobile commerce literature. Pollard and Morale (2015) emphasized the importance of approaching the small firms' environment, and to inform knowledge and theory from the evidence generated from other small firms' practices.

2. E-Grocery Mobile Application Models

Mkansi et al. (2020) provide a detailed account of e-grocery mobile applications in the urban, township and rural areas of South Africa. The dominant operators in e-grocery mobile applications are small e-tailers such as Spazapp, Y-shop, Zulzi, Vuleka, Smartsentials, Sisonke Africa, Grocerease, and Buy Grocery Online. The distribution models adopted by the small e-grocery retailers are classified into the following three categories: 1) the mobile application retailer-configured model, 2) the mobile application wholesale-configured model, and 3) the mobile application brand manufacturer-configured model. The order stock and order storage logistics elements of the e-grocery mobile application models are key distinctive features that set the three models apart, much more than order delivery, order pick and order entry strategies (see Table 1). For example, the mobile application retailer-configured model's stock and

storage are mainly competitors' major grocery stores. Hence, the mobile application brand manufacturer and FMCG-configured, and mobile application wholesale-configured models' stock and store groceries from fast-moving consumer goods and wholesalers, respectively. Order delivery, and order pick are mostly handled by independent contractors (third parties).

The one aspect which the three models have in common is order entry which is mobile application-based, and for most of the small e-grocery retailers, orders are placed on the app by students, women, and youth on behalf of the digitally challenged market segments. Looked at differently, the e-grocery mobile applications' fulfilment functions reside primarily with competitors and third parties, except for the technology. Most of the small e-grocery retailers operate in the urban, township and rural areas of the Gauteng, Western Cape and KwaZulu-Natal provinces, with the exception of Spazzapp that has a national and international footprint, and Buy Grocery online that has national distribution capabilities. Of them all, Grocerease and Zulzi limited their operations to the urban market at the time of the study by Mkansi et al. (2020).

The reliance on competitors and third parties makes e-grocery retailers more susceptible to the impact of COVID-19 for several reasons:

- **Firstly,** South Africa's longest level 5 and 4 lockdown restrictions precluded businesses without essential business certificates from operation. The preclusion yields a complex challenge for e-grocery mobile applications, whose e-fulfilment, though essential, is dependent on competitors' grocery stock. Thus, small e-grocery mobile application retailers need a comprehensible case to register and be considered essential by The Companies and Intellectual Property Commission (CIPC) of South Africa (South African Government, 2020). The essentiality criterion placed a strain on the **order stock** logistics element of e-grocery mobile application in many respects, especially, due to the relative erratic consumption patterns, limited labor, and panic buys that left many customers and online and offline grocery retailers scrambling for the most basic commodities in most grocery stores. Beyond a sudden influx of grocery consumption, the panic buying gave rise to stock unavailability and substitutions, which made it impossible to achieve 100% order fulfilment. Consequently, leading to potential complaints and poor service standards. At worst, the requirements of social distancing and 50 people capacity caps in stores placed an enormous challenge on the on-time delivery of e-groceries. However, it remains unknown if these issues stifled or propelled e-grocery mobile applications, and if so how and to what extent?
- **Secondly,** the distribution of goods during lockdown was limited to those logistics companies and drivers with permits, which excluded most of the independent drivers that service e-grocery mobile applications. The permits fostered both negative and positive implications for the **order delivery** logistics elements. On the positive side, the permit restrictions implied decreased traffic, which led to reduced environmental impacts, and less road congestion for quick delivery of e-grocery orders. Negatively, it reduced the pool of independent drivers able to service e-grocery orders, which impacted on order delivery capacity and capabilities. Further, a limited pool of drivers induces a supply and demand challenge that most likely alters the pay rate of drivers. In some cases, the drivers' licenses expired, with no place to renew them. After lockdown, the drivers will have to contend with the backlogs that have bogged the traffic department prior COVID-19. In some upstream chains, the requirements related to drivers' permits had indirect implications on the quick delivery of fresh produce, such as fruit and vegetables, to stores and wholesalers that the e-grocery mobile application stock for e-fulfilment. The slow delivery of fresh produce has an impact on the dates of fruits and vegetables, which if delivered three or four days later, have a shorter shelf life, and subsequently, the quality of dates available for e-grocery **order picking**. However, it remains unknown how the e-grocery mobile application retailers managed the challenge.

- **Thirdly,** only essential workers with permits from approved essential grocery retailers could have unrestricted movement to work, which affected **order entry and order picking**. In cases, where order entry and order pick foot agents could operate, issues of health and safety compliance ensued, placing another layer of hygiene adherence to COVID-19 Occupational Health and Safety Measures in Workplace as stipulated in Notice 479 Annexure A (SA government, 2020). Whilst guiding laws are accessible for small e-grocery retailers, the time it takes to administer and enforce safety and hygiene to foot agents in different places presents another logistical challenge. Further, the issue of compliance places a resource burden in terms of masks, temperature test measures, and sanitizers, which becomes critical for a business with thin profit margins. In a case where the employee's temperature exceeds 37.5 ºC and above, the e-grocer is left with a labor shortage. At worst, the National Department of Health required all goods to be sanitized. Hence, the interest in exploring how these compliance issues were handled by e-grocery mobile application retailers, and who replaced the foot agents, if any?
- **Fourthly,** for those small e-grocery mobile application models that extend to township garages and households, the levels 5, 4, and 3 lockdown restrictions imposed unimaginable logistical complexities on **order storage**, primarily, because households were prohibited from mixing or engaging in business activities, as they are not registered businesses to qualify as an essential service. Essential service in South Africa is outlined in section 213 and section 71(8) of the Labour Relations Act 1995 (Act No. 66 of 1995), and include wholesale and retail stores, but excludes the last mile chain or partnerships. In this context, how did the e-grocery mobile application retailers justify their operations? How did the restrictions impact the model and distribution capabilities and capacity?
- **Lastly,** many of the market demographics and segments where small firms aggregate demand in township and rural areas were badly affected, and many people lost their jobs, which affected demand, and ultimately, had a grave effect on the profit and order volume. Put differently, the morbidity induced by COVID-19 undermined the basic consumption patterns and order volumes that hold supreme the aggregate power of e-grocery mobile application. As such, the pandemic threatens access and reliance to competitors' resources and established townships and rural markets.

Against these odds, did small e-grocery mobile application operators survive or die? If they survived, how did they navigate the COVID-19 restrictions that were placed on them? The next sections sought to address these questions by exploring insights from the CEOof some of the e-grocery mobile application retailers.

Table 1.
Differences and similarities of the e-grocery mobile application models (Mkansi et al., 2020)

#	Logistics processes	Distribution models		
		Retailer-configured model	**Wholesaler-configured model**	**Brand-configured model**
1	Order storage	Competitor's store, i.e., Woolworths, Pick n Pay, Checkers	Distribution centers, kiosks, and bigger spaza shops' customers	Distribution centers, and township household garages
2	Order delivery	Independent drivers, i.e., Uber, Taxify, car owners	Independent drivers, i.e., township people with cars, and own drivers	Distribution centers, kiosks, and bigger spaza shops' customers'
3	Order picking and assembly	Independent personal shoppers, i.e., unemployed youth, students	Independent personal shoppers, i.e., unemployed youth, students	Independent personal shoppers, i.e., unemployed youth, students
4	Order stock	Competitors' stock of ambient, chilled, frozen and fresh produce	Competitors' stock of ambient and fresh produce that can be stored as ambient, e.g., potatoes	Competitors' stock ambient
5	Order entry and processing	Mobile app, WhatsApp, Emails	E-grocery mobile app	E-grocery mobile app

3. COVID-19 Impact: E-Grocery Mobile Application CEO's Insights

This section sought, first hand, the insights of the CEO on how COVID-19 impacted small e-grocery mobile application retailers, as envisaged and conceptualized against the lockdown restrictions discussed in the previous section. Whilst access to all eight e-grocery mobile applications proved difficult, one CEO managed to offer insight that relates specifically to the e-grocery mobile application wholesale-configured model. Prior to exploring the impact on specific logistics elements, the CEO's general outlook on the COVID-19 impact is that it advanced their business operations in a positive manner.

> *"COVID-19 has actually helped us to get ahead and also allowed us to make progress on our technology without pressure. There are lots of unique things that we managed to develop, and it has attracted interest of big businesses. We aim to re-launch in the next year".*

However, the e-grocers also witnessed increased competition from both small and big e-grocery retailers, since the last interview with Mkansi et al. (2020). For example, Shoprite Checkers, one of the biggest grocery retailers in South Africa launched Sixty60, an on-demand e-grocery mobile application with a value proposition beyond price, which is delivery of e-groceries purchases within 60 minutes of order placement. Hence, Pick n Pay, also a top five grocery retailer, bought Bottles, another on-demand grocery mobile application, which previously focused on an on-demand alcohol delivery application:

> *"The e-grocery space has shifted a lot in the last year and since we had interviews with you for the first paper. Big retailers such as checkers launched Sixty60, and Pick n Pay bought Bottles. Lots of big grocery retailers came to the e-market. Literally, in the last twelve months, all the big grocery retailers have launched an online platform and some of them are doing really well. But that has created challenges for small e-grocery players because they do not have a unique proposition. All big grocery retailers have supply network, and that is what small e-grocery mobile application don't have, because they buy from the big grocery retailers stores and try to distribute. The world of e-groceries has shifted a lot. There are new e-grocers that have come to the table such as Jumia, a Nigerian platform listed in the US stock exchange that launched early this year. What we noticed is that because people could not go to the shops, the rate of sales for most stores went down, so the quickest solution was to figure out how to get products into people's homes".*

The CEO was asked about the recent development of other e-grocery mobile applications, such as the retail-configured models that partnered with financial banks for e-customers to earn reward points each time they shop in their platform. The CEO opinioned that there are opportunities for many players and strategies, including those e-commerce platforms that focus mainly on convenience, and then layer other services on top. However, his specific model was on creating value at a price point. Interestingly, both rewards and discounted price strategies are geared to offer money back to customers. However, discounted price offers immediate cash back, over a reward system.

> *"It is really obvious that there is a space for those who are providing e-commerce just to provide convenient service and over that they try to layer other services and lure customers. The way we are doing it is, we aggregate service and demand by creating value at the price* point. *Very few businesses have the guts to try, hence, we have the approach that definitely have a good chance of succeeding. Our add-ons are not so much that people will get reward from banks but will get reward in their wallets through better priced products".*

Following on the general perspective of the impact of COVID-19 on e-grocery mobile applications, the dialogue turned into issues of specific logistical elements from order entry, order stock, order pick, order storage and order delivery. The CEO offered interesting customer responses, especially considering that the majority are digitally challenged.

3.1. Order Entry

In terms of order entry, customers reached out to e-grocers through WhatsApp, which in turn, replaced foot agents who normally place orders on behalf of most township market segments. Even though the customers' responses were not through the actual e-grocery mobile application, the insight reveals that customers adapt and adopt e-grocery option quicker when their alternative online option becomes the most desirable and safer option.

> "*We did not use young people, a lot of it was digital. People reaching out needing things delivered and we were able to use technology such as phone calls, WhatsApp to manage the process and plan the deliveries. It was almost like COVID-19 helped us get ahead, it was quite good".*

Most of the e-grocery orders (60%) were reportedly made by family members, and wealthy South African and foreign nationals on behalf of the township, rural, and communities living in slums, especially those that were excluded from COVID-19 aid. The shift of the e-grocery market segment to high income individuals was crucial for the e-grocer's experiment with elasticity price demand, which was reported to be favorable for the e-grocery mobile application wholesale-configured model. The e-grocer enjoyed at least up to 20% markup from the usual market prices offered in normal times.

> *"Most orders came from individuals who wanted us to deliver to their families and friends in townships. Even though the government had food aid, most of the foreigners were not beneficiaries. Most of their family members, national groups, and religious organizations, placed their orders. For examples, we delivered lots of food parcels for the Mozambique community in townships. Some of the more affluent Mozambicans came together ordered on our app for us to deliver to their fellow disadvantaged communities. What we were able to test was price elasticity, at some point we added 20 percent markup, but they still thought it was cheap. We noticed that what the affluent market buys normally is over the top compared to our offerings. For example, 10 kg white star maize meal is R87 in retail shops, versus R47 12 kg shaya maize meal from us. So, 20 percent markup on R47 is still good compared to R87".*

3.2. Order Stock

For the e-grocery mobile application wholesale-configured model, issues of stockouts were minimal. In cases of unavailability, customers were willing to accept whatever alternative product available. The insight reveals a peculiar condition of customers' behavior during a pandemic that alters the intersection between customers' expectation and e-grocery distribution. Looked at differently, pandemics such as COVID-19 can act as a moderating factor that affects the degree of customers' behavior between demand and supply.

> *"There was no real stock problem because people were willing to switch. What was available is what people would take. We source at wholesalers; we did not have that many stockouts. In retailers you would find stockouts. Stock was not necessarily a problem; the bigger issue was finding people who can move around during the height of the lockdown. That was really a bigger challenge".*

3.3. Order Pick

Order pick for the e-grocery mobile application wholesale-configured model was another affected logistics elements. Especially, because foot agents such as students and women were restricted from picking. As such, the e-grocer turned to wholesalers and freelance drivers for assistance. "*The drivers helped us pick, mostly freelance drivers. Some wholesalers helped us pick, but others could not assist. Student agents are still on-board, but their service was limited during COVID-19. Some wholesalers do not like what we have become".*

3.4. Order Delivery

Whilst finding independent drivers with permits was a challenge for the e-grocery mobile application industry, the drivers that usually deliver for big retailers with bakkies (also known as a pick-up truck) rescued the e-grocery mobile application retailer. However, queuing became a challenge for the on-time delivery of goods. The issue of low order volume vis-à-vis profit margin appeared to have undermined the partnership that the e-grocer had with the logistics company. The finding shows the persistence of the challenge relating to order volumes and transportation, at worst, during critical times.

> *"We had signed on a logistics partner just before February, but even though they could work, they could not deliver for us because the scale was too small for them. We literally have guys with bakkies who secured permits. Most of the drivers who moved goods for retailers were able to get permit and we hired them use those permits. Some of the wholesalers had guys at their premises who were ready to deliver within townships. The difficulty then became the queues in wholesalers because large numbers of shoppers were prohibited".*

In relation to the application and approval as an essential service with the CIPC, the e-grocer reported no difficulty, but rather reported on the flexibility of government in accommodating small e-grocery retailers. The verbatim expression of the CEO is that *"it was not a problem at all, we registered as a digital grocery distributor/ retailer. And if one of our bakkie or vehicle was stopped, the driver issued a permit to deliver goods. The idea of being an essential service was broad and as long as anyone was in a supply chain of groceries, they were fine".*

3.5. Order Storage

The order storage of the e-grocery mobile application was one of the affected logistics elements, especially for the model that extends to kiosk and household partnerships. The extension was deemed impossible, due to lockdown restrictions that prohibited household visitation. However, there was less of an impact on the day-to-day operations due to the increased attendance of e-groceries orders. Looked at differently, the home attendance that was induced by COVID-19, helped mitigate against the disruption to kiosks and household extensions. Further, the restriction gave rise to coopetition with those businesses that were impacted by the lockdown, such as liquor traders, hence, the renewed affiliate model.

> *"Our kiosks and partnership with households' garages were effectively drop-points, but COVID-19 made it impossible to continue use them. However, we have a new partnership with township tavern association (liquor distributors), whose businesses were affected by the restrictions. They wanted to diversify their business to survive and we wanted new drop-offs points, hence we signed an agreement with them. We changed the name from kiosks to affiliates".*

Besides exploring the impact of COVID-19 on logistical elements, issues of customers' demand for e-groceries were explored, considering that many people lost their jobs, which impacted order volumes and demand. Rather than a decrease in demand, the e-grocer saw a

shift of customers placing orders, where either family or friends would order on behalf of their township relatives. The shift appears to have equally influenced response to unavailability and substitution, since most were willing to consider substitutes regardless of price.

> *"And most of the customers that we got were people who were trying to send food and groceries to their family and friends in townships. That was mostly 60% of what we did, because they were able to order and if we needed to change something because it was not available, or the prices were high, they would just opt for something else".*

4. Discussion

Although COVID-19 presented the grocery business with increased demand and e-commerce opportunities, it brought an array of challenges that affected all the logistics elements from order delivery, order entry, order pick, and some aspects of order storage for the e-grocery mobile application wholesale-configured model. In terms of order delivery, issues related to queuing, hiring drivers with permits, and order volumes altered order delivery times and pay rates to drivers. Regardless, small e-grocers operating a mobile application wholesale-configured model were able to navigate through partnerships with those bakkie owners who had permits to deliver for big retailers. It remains unclear, however, how the deviations arising from the partnership and multiple stops were managed. The impact of COVID-19 across all e-grocery logistics elements advance Hobbs (2020) and Mussell et al.'s (2020) findings of demand shocks by providing complementary supply shocks in the context of an e-grocery mobile application.

Order pick and order entry were equally affected as it was impossible to have foot agents collecting orders and picking groceries on behalf of township and rural customers. However, a pleasant surprise was the response of digitally-challenged markets to e-grocery through the use of WhatsApp, telephone calls, and family members. As such, WhatsApp and phone calls were the bridge between the e-grocery mobile platform and the digital challenges of the market segment. Interestingly, the acts of kindness by wealthy South Africans and foreign nationals propelled e-grocery mobile application orders during lockdown, especially in their response to the various communities that were excluded from the COVID-19 aid. Almost 60% of the orders placed on the e-grocery mobile application wholesale-configured model were made by wealthy nationals or family members for delivery to people in the townships and rural areas, and also for those living in shacks in informal settlements, mostly for communities excluded from COVID-19 aid packages.

Order stock and order storage were partially affected, but were manageable. There were reports of unavailability and substitutions, but they were quite minimal for the wholesale model. The insight supports Mkansi et al.'s (2020) findings on the moderate impact of unavailability issues on the e-grocery mobile application wholesale-configured model. In those instances of unavailability, customers were willing to take an alternative product, regardless of the price, because many orders were made by wealthy or well-to-do individuals on behalf of township families and communities. Put differently, the e-grocery observed a positive reaction to price elasticity during the COVID-19 lockdown. The extension of order storage to kiosk and households were equally affected, but not to a greater extent, since there was always 100% home attendance for e-grocery orders. Thus, the higher the availability of people to receive e-grocery orders, the lower the necessity of kiosks and household partnerships and returns.

Notably, the pandemic gave rise to competition as most grocery retailers realized the essentiality of grocery retail that weathers the storms of restrictions imposed on many businesses during the pandemic. However, most competitors still limit their e-grocery operations to urban areas, leaving the small e-grocery mobile application retailers to continue to appropriate and exploit the townships and rural market opportunities.

In summary, although COVID-19 presents exogenous constraints that are intertwined across all logistics elements of the e-grocery mobile applications, the CEO of the e-grocery mobile application wholesale model point to numerous positive issues that were core to perpetuating new e-grocery mobile application heights.

5. Conclusion, Contribution, and Limitations

This chapter is inspired by the outbreak of COVID-19, which has triggered both negative and positive impacts on businesses across different sectors. This chapter unearths how the COVID-19 pandemic has re-aligned the logistics elements of small e-grocery mobile application retailers. Overall, the pandemic appears to have had a positive impact on the e-grocery mobile application wholesale-configured business model and development, but it remains unknown how it impacted the e-grocery mobile application retail and brand-configured models. Regardless of its inability to offer COVID-19 impact across all e-grocery mobile application models, the chapter is still crucial in understanding how small e-grocery retailers evolve in the face of pandemics. The issues raised across all logistics elements suggest that COVID-19 induced a rapid evolving e-grocery mobile application model with great potential for coopetition.

Succinctly, the chapter offers the following key contributions regarding the implications for COVID-19 types of pandemics on the e-grocery mobile application:

- **Logistics Elements** – COVID-19 has less of an effect on the order storage and order stock of the e-grocery mobile application, but does affect the delivery, order entry and order picking, especially for those e-grocery mobile application models that are highly dependent on foot agents. On the contrary, it is safe to argue that the opposite manifests for those e-grocery operators independent of foot agents, and that is, less impact on order entry, order pick, and order delivery, but more on order stock and order storage for the e-grocery mobile application retail-configured model. Put differently, a humanitarian pandemic is most likely to affect the logistics elements differently, depending on the type of e-grocery mobile application model. The moderating factors for the impact across models are foot agents and sources of stock, that is, the higher the dependency on foot agents, the higher the impact on order delivery and order pick. Hence, the higher reliance on retail stores for stock, the higher the chances of impact on order storage, and order stock (i.e. unavailability and substitution issues). To mitigate against similar conditions, small e-grocery mobile application can explore the use of robotics to manage the logistics elements that depend mostly on foot agents. Further, coopetition with logistics companies and drivers with permits can help sustain the e-grocery mobile application when the order delivery logistics elements are affected.
- **Price Elasticity** – during a humanitarian pandemic like COVID-19 the cross-price elasticity of demand in the e-grocery sector is most likely to be positive, and the desire for e-grocery does not diminish as price increases.
- **Diffusion of Innovation** – the rate of e-grocery adoption by both customers and retailers is high in pandemics that place great constraints on freedom of movement. At best, digitally-challenged markets are most likely to adapt innovation, such as e-grocery mobile applications, by using complementary digital bridges such as WhatsApp and telephone calls. Put simply, in a restricted world, digital is everything.
- **Mobile Application Wholesale-Configured Model** – this mobile application model is less susceptible to stockouts, and presumably also the mobile application brand/ FMCG-configured model. Hence, the mobile application retail-configured model is more susceptible to stockouts during a humanitarian pandemic like COVID-19.

- **Market Segment** – E-grocery market segments change during humanitarian pandemics, and most likely, from low-income customers to high income customers, who in most cases, care for disadvantaged communities. Further, during pandemics the spirit of Ubuntu is high, that is, caring, humanity, and sharing of wealth with family members and supplying those excluded from COVID-19 aid.
- **Customer Behavior** – Pandemics like COVID-19 are most likely to alter the intersection between customers' expectations and logistics elements that affect the degree of demand and supply positively, rather than negatively. For example, customers are willing to consider alternative products, regardless of the price, when the order stock logistics element is affected during COVID-19, with less impact on customers' perception of service standards. Thus, customers are highly flexible during pandemics, more than they would be in normal times.
- **Competition** – competition and coopetition increase during humanitarian pandemics. For example, most grocery retailers migrated to e-grocery offerings, which increases competition. However, big retailers' drivers informally coopted with small e-grocery retailers to help sustain their distribution capabilities, and ultimately, their businesses. In addition, liquor traders signed an affiliate agreement to become e-grocery drop points, whilst giving liquor traders a diversification opportunity to render them as essential services.

This chapter is not without limitations, the impact of COVID-19, as discussed, is reflective of a single e-grocery mobile application model, specifically, the mobile application wholesale-configured model, therefore, it cannot be generalized to all e-grocery mobile application models. Further, as the chapter is written at the height of the pandemic, it is unable to offer much explanatory power in terms of the rapid changes that are still to come. The insight discussed is also from the perspective of a single e-grocery mobile application's CEO, due to the COVID-19 restrictions and busy schedules of other CEOs. Nonetheless, the purposively sampled CEO is one of the pioneers of the e-grocery mobile application model with a great bird's eye view of the COVID impact across the logistics elements. The chapter's attempts to draw real insights, rather than merely conceptualizing the impact of COVID on e-grocery mobile applications, is also a plausible contribution to knowledge. Future studies can offer a comparative analysis of COVID-19 across the three e-grocery mobile applications.

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